

How ATEM Tally Works

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This document is an overview of the Blackmagic ATEM and Camera Tally system. While it does not describe the protocol that is used or provide any software towards generating a tally signal, links to documents will be provided.

There are several sections to this document:

- The ATEM Switcher Tally System
- Extracting Tally Information from the ATEM Switcher
- How Blackmagic Camera Tally Works
- Embedding Tally Information to Blackmagic Cameras
- Troubleshooting the Tally System

The ATEM Switcher Tally System

All ATEM switchers have a single tally system that includes a Program Tally (Red) and a Preview Tally (Green) to supported cameras and displays. Even if you have a multi-Mix Effects (ME) switcher, Tally is only applied to any source that is active on ME1 of that switcher. Therefore, if a camera is active on ME2, that ME2 must be active on ME1 in order for the tally to be active.

Tally is embedded as ancillary data in the ATEM Program output SDI stream. For all ATEM switchers, all SDI outputs contain the same ancillary tally data, so any signal may be used with two exceptions. ATEMs with down converted outputs and legacy Multiview outputs do not contain tally data, so it is safe to connect any ATEM Program, Preview, Auxiliary or other SDI output to a device for tally extraction. The SDI Tally Protocol may be found in the ATEM Production Studio Switcher Manual at <https://www.blackmagicdesign.com/support/family/atem-live-production-switchers>

Tally information is also available on a connected Ethernet with the ATEM. This generally requires the ATEM SDK (Software Development Kit) or the ATEM GPO Mini Converter. The ATEM SDK is available from the website at <https://www.blackmagicdesign.com/support/family/atem-live-production-switchers>

The ATEM switchers do not have any sort of GPI input or method to trigger the embedded tally other than using the SDK.

Extracting Tally Information from the ATEM Switcher

Blackmagic products capable of extracting embedded tally data include:

- URSA Mini (all models)
- URSA Mini Pro (all models)
- URSA Broadcast
- Television Studio Camera (HD and 4K)
- Micro Studio Camera
- Shield for Arduino
- Multiview 16
- Multiview 4

- Multiview 4 HD
- GPI and Tally Interface
- Shield for Arduino

Blackmagic Cameras extract tally based on a Camera ID number set in the camera menus. The ID number must correspond to the physical input jack on the ATEM switcher, and not necessarily a defined camera number by the user. For example, a Micro Studio Camera connected to the first SDI input port #5 on the ATEM Television Studio HD might be logically called Camera 1 by the user, but needs to be ID #5 to the tally system because it is physically connected to SDI Input #5.

The **GPI and Tally Interface** is a simple mini converter-type box that provides eight (8) relay contact closures which may be used in a variety of external tally situations. The box connects via Ethernet to the ATEM and is configurable as to which bank of 8 inputs are associated (1-8, 9-16, and so on). The USB ATEM Setup Utility may be used to set the IP Address of the box and the ATEM as well as the input selection range. As this box is also used with Blackmagic VideoHubs with a different protocol, the user would set this box for ATEM use in the utility.

1 - GND	14 - GND
2 - GND	15 - GND
3 - GPI 8 (IN)	16 - Tally 8 (OUT)
4 - GPI 7 (IN)	17 - Tally 7 (OUT)
5 - GPI 6 (IN)	18 - Tally 6 (OUT)
6 - GPI 5 (IN)	19 - Tally 5 (OUT)
7 - GPI 4 (IN)	20 - Tally 4 (OUT)
8 - GPI 3 (IN)	21 - Tally 3 (OUT)
9 - GPI 2 (IN)	22 - Tally 2 (OUT)
10 - GPI 1 (IN)	23 - Tally 1 (OUT)
11 - GND	24 - GND
12 - GND	25 - GND
13 - GND	

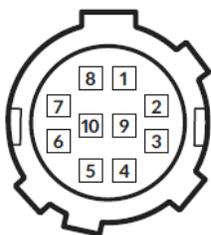
GPI and Tally Interface DB-25 Female Connector

Pins 3-9 and GND are the contacts used for ATEM tally. The Ground is common to all relays so that may impact design of any external interface. The contacts are rated at 30 Volts, 1 Amp. Use caution to not overload the relays.

The **Multiview** products expect to extract tally from an ATEM or Shield for Arduino when the SDI is connected to the last input on the respective device. The tally capability is enabled in the menu or configuration utility for these products.

The **Shield for Arduino** is capable of decoding tally from the SDI input and through programming that provides external GPO outputs to custom devices, or re-embeds the SDI output for the purposes of passing original Tally or converting original tally to new tally numbers. An example would be converting the tally for Camera 5 in the Television Studio HD to Camera ID #1 to make the camera number match the local setup. The Shield is capable of extracting and embedding, passing or blocking ATEM tally information in the SDI signal.

The **Camera Fiber Converter** has a “Tracker” connector on the back which makes a tally voltage available to the user.



10 pin Hirose
'tracker' connector

Pin	Description
6	Ground
9	Green Tally On=12Vdc, Off=Ground
10	Red Tally On=12Vdc, Off=Ground

The mating plug may be found on places like Amazon. The part number is: HIROSE ELECTRIC HR10A-10P-10P(73) 10 Position Free Hanging Push Pull Male Terminal Microconnector Plug.

Note: The manual has the incorrect definition of the Tally On/Off. The above chart has been verified. The 12Vdc will not provide any usable current so should not be directly connected to a lamp. It uses open collector technology.

How Blackmagic Camera Tally Works

The Blackmagic Studio-type cameras listed above support embedded SDI tally in the return feed. The Camera ID found in the Settings Menu would be set to the physical input jack on the ATEM feeding the camera. In other cases, the Camera ID would be set to match the expected embedded tally signal form other origins.

SDI Tally information may come from a variety of places:

- Blackmagic ATEM Switchers
- Blackmagic Shield for Arduino
- Blackmagic Studio Fiber Converter
- Some third party embedders
- Some third party video switchers

In all cases, there are no external tally connections to the cameras directly. The Shield for Arduino and Studio Fiber Converter do provide external connections for tally.

Some Blackmagic Studio-type cameras support the Green Preview tally. Some users have expressed the ability to suppress the Green tally and retain the Red one. While the tally may be enabled or disabled within camera menus, there is no setting for separate control of the Green tally. The Shield for Arduino may be programmed to suppress the green tally if desired.

Embedding Tally Information to Blackmagic Cameras

There are a couple of methods to embed tally information into the SDI feeding Blackmagic Cameras beyond using ATEM switchers.

The **Shield for Arduino** is a 3G-SDI product that is capable of both extracting Tally data from the SDI input and embedding tally to the SDI output. There are two modes for the shield: One is for extracting tally from the input for custom processing, and the other is for embedding tally in the SDI output for custom purposes. The shield is capable of blocking the input tally data and providing new data; it can also extract incoming tally data and either add or change outgoing data.

One example is a third party switcher used for switching while an ATEM switcher is simply used for Blackmagic Camera Control. The shield may be set up to pass ATEM camera control while blocking ATEM tally and inserting new tally from the third party switcher.

It is important to note the Blackmagic Shield for Arduino does not come setup to do any of these things without user programming and possible additional I/O hardware. With the Shield, there are example sketches (programs) that do similar functions that can easily be modified to accomplish the normal tasks. The Shield is normally considered a hobby product but is easily incorporated in this environment providing great flexibility to the user.

Information on the Blackmagic Shield for Arduino may be found here: <https://documents.blackmagicdesign.com/UserManuals/ShieldForArduinoManual.pdf?v=1533539647000> or on the Blackmagic Support site at: <https://www.blackmagicdesign.com/support/family/professional-cameras>

The **Studio Fiber Converter** provides an external interface to third party Tally interfaces that will enable tallies on Blackmagic supported cameras. Because the Studio Fiber Converter naturally connects to the Camera Fiber Converter, there are several logical camera choices (URSA Mini, URSA Mini Pro and URSA Broadcast), since this product attaches to the back of these cameras.

On the back of the Studio Fiber Converter there is a DB-25 Female connector which has pinouts for both Red and Green tallies to the camera.

Pin	Description
11	Red Tally In On = 5-24Vdc, Off = 0Vdc
12	Red Tally Ground
24	Green Tally In On = 5-24Vdc, Off = 0Vdc
25	Green Tally Ground

A voltage must be applied to make the tally work. The tally will be visible at the camera and the Studio Fiber Converter when applied.

Very Important: External Tally functionality in the Studio Fiber Converter **only** works when an ATEM SDI signal is applied to SDI Input #1. This would normally be the case anyway for camera control, but it is important to keep in mind when troubleshooting these functions.

Troubleshooting the Tally System

Here are some points to check when troubleshooting the tally.

- Make sure the Camera ID matches the physical input jack to the ATEM switcher.
- The tally indicator on the Multiview monitor should indicate so we know the source is on the air.
- Feed SDI Program or Auxiliary video from the ATEM to the Camera SDI input. HDMI outputs do not carry tally as well as some Multiview (legacy units) and any down converted Program outputs.
- Test the SDI feed to the camera from the ATEM. You should see Program video in the return at the camera. For the Micro Studio Camera, it may be useful to have a portable monitor like the Video Assist to check for a valid SDI signal.
- The tally signal will safely pass through Routing Switchers, VideoHubs, SDI Das and the Teranex AV and Express models. The tally signal might not go through most scaling, processing, or any compression devices.

- With the Studio and Camera Fiber Converter in the chain, make sure the Camera Frame Rate exactly matches the ATEM frame rate. The ATEM SDI must be connected to the Studio Fiber Converter SDI Input #1.
- If using the GPI Tally Interface, use the ATEM Setup Utility connected via USB and make sure it is in ATEM mode with valid IP address and valid switcher IP address. When you make switcher selections you should hear the relays click if you hold it up to your ear.
- If using the Shield for Arduino, make sure the input SDI signal is 3G or less. This means 1080p59.94 or less.